

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

- 1 1. (Currently amended) A method for detecting a failure sequence or other
2 undesirable system behavior in a computer system and subsequently taking a
3 corresponding remedial action, comprising:
4 receiving instrumentation signals from the computer system while the
5 computer system is operating;
6 determining from the instrumentation signals if the computer system is in
7 a failure sequence that is likely to lead to undesirable system behavior, such as a
8 system crash, wherein determining if the computer system is in a failure sequence
9 involves:
10 determining correlations between instrumentation signals in
11 the computer system, wherein determining the correlations
12 involves using a non-linear, non-parametric regression technique to
13 determine the correlations, whereby the correlations can
14 subsequently be used to generate estimated signals,
15 deriving estimated signals for a number of instrumentation
16 signals, wherein each estimated signal is derived from correlations
17 with other instrumentation signals, and
18 comparing an actual signal with an estimated signal for a
19 number of instrumentation signal to determine whether the
20 computer system is in a failure sequence;

21 wherein the determination involves considering predetermined
22 multivariate correlations between multiple instrumentation signals and a failure
23 sequence that is likely to lead to undesirable system behavior; and
24 if the computer system is in a failure sequence that is likely to lead to
25 undesirable system behavior, taking a remedial action.

1 2. (Original) The method of claim 1, wherein taking the remedial action
2 involves generating an alarm.

1 3. (Original) The method of claim 2, wherein generating the alarm
2 involves communicating the alarm to a system administrator so that the system
3 administrator can take the remedial action.

1 4. (Original) The method of claim 3, wherein communicating the alarm to
2 the system administrator involves communicating information specifying the
3 nature of the failure sequence to the system administrator.

1 5. (Original) The method of claim 1, wherein taking the remedial action
2 can involve: killing processes, blocking creation of new processes, or throwing
3 away work, until the system is no longer in a failure sequence that is likely to lead
4 to undesirable system behavior.

1 6 (Canceled).

1 | 7. (Currently amended) The method of claim 1-~~claim 6~~, wherein
2 comparing an actual signal with an estimated signal involves using sequential
3 detection methods to detect changes in a relationship between the actual signal
4 and the estimated signal.

1 8. (Original) The method of claim 7, wherein the sequential detection
2 methods include the Sequential Probability Ratio Test (SPRT).

1 9 (Canceled).

1 10. (Currently amended) The method of claim 1-~~claim 9~~, wherein
2 determining the correlations involves:
3 deliberately overloading the computer system during a test mode to
4 produce undesirable system behavior, such as a system crash; and
5 identifying multivariate correlations between multiple instrumentation
6 signals and the system crash.

1 11 (Canceled).

1 12. (Currently amended) The method of claim 1-~~claim 11~~, wherein the
2 non-linear, non-parametric regression technique can include a multivariate state
3 estimation technique.

1 13. (Original) The method of claim 1, wherein the instrumentation signals
2 can include:
3 signals associated with internal performance parameters maintained by
4 software within the computer system;
5 signals associated with physical performance parameters measured
6 through sensors the computer system; and
7 signals associated with canary performance parameters for synthetic user
8 transactions, which are periodically generated for performance measuring
9 purposes.

1 14. (Currently amended) A computer-readable storage medium storing
2 instructions that when executed by a computer cause the computer to perform a
3 method for detecting a failure sequence or other undesirable system behavior in a
4 computer system and subsequently taking a corresponding remedial action,
5 wherein the computer-readable storage medium includes magnetic and optical
6 storage devices, disk drives, magnetic tape, CDs (compact discs), and DVDs
7 (digital versatile discs or digital video discs), the method comprising:
8 receiving instrumentation signals from the computer system while the
9 computer system is operating;
10 determining from the instrumentation signals if the computer system is in
11 a failure sequence that is likely to lead to undesirable system behavior, such as a
12 system crash, wherein determining if the computer system is in a failure sequence
13 involves:
14 determining correlations between instrumentation signals in
15 the computer system, wherein determining the correlations
16 involves using a non-linear, non-parametric regression technique to
17 determine the correlations, whereby the correlations can
18 subsequently be used to generate estimated signals,
19 deriving estimated signals for a number of instrumentation
20 signals, wherein each estimated signal is derived from correlations
21 with other instrumentation signals, and
22 comparing an actual signal with an estimated signal for a
23 number of instrumentation signal to determine whether the
24 computer system is in a failure sequence;
25 wherein the determination involves considering predetermined
26 multivariate correlations between multiple instrumentation signals and a failure
27 sequence that is likely to lead to undesirable system behavior; and

28 if the computer system is in a failure sequence that is likely to lead to
29 undesirable system behavior, taking a remedial action.

1 15. (Original) The computer-readable storage medium of claim 14,
2 wherein taking the remedial action involves generating an alarm.

1 16. (Original) The computer-readable storage medium of claim 15,
2 wherein generating the alarm involves communicating the alarm to a system
3 administrator so that the system administrator can take the remedial action.

1 17. (Original) The computer-readable storage medium of claim 16,
2 wherein communicating the alarm to the system administrator involves
3 communicating information specifying the nature of the failure sequence to the
4 system administrator.

1 18. (Currently amended) The computer-readable storage medium of claim
2 14-claim 16, wherein taking the remedial action can involve: killing processes,
3 blocking creation of new processes, or throwing away work, until the system is no
4 longer in a failure sequence that is likely to lead to undesirable system behavior.

1 19 (Canceled).

1 20. (Currently amended) The computer-readable storage medium of claim
2 14-claim 19, wherein comparing an actual signal with an estimated signal involves
3 using sequential detection methods to detect changes in a relationship between the
4 actual signal and the estimated signal.

1 21. (Original) The computer-readable storage medium of claim 20,
2 wherein the sequential detection methods include the Sequential Probability Ratio
3 Test (SPRT).

1 22 (Canceled).

1 23. (Currently amended) The computer-readable storage medium of claim
2 14-claim 22, wherein determining the correlations involves:
3 deliberately overloading the computer system during a test mode to
4 produce undesirable system behavior, such as a system crash; and
5 identifying multivariate correlations between multiple instrumentation
6 signals and the system crash.

1 24 (Canceled).

1 25. (Currently amended) The computer-readable storage medium of claim
2 14-claim 24, wherein the non-linear, non-parametric regression technique can
3 include a multivariate state estimation technique.

1 26. (Original) The computer-readable storage medium of claim 14,
2 wherein the instrumentation signals can include:
3 signals associated with internal performance parameters maintained by
4 software within the computer system;
5 signals associated with physical performance parameters measured
6 through sensors the computer system; and
7 signals associated with canary performance parameters for synthetic user
8 transactions, which are periodically generated for performance measuring
9 purposes.

1 ~~2827~~. (Currently amended) An apparatus that detects a failure sequence or
2 other undesirable system behavior in a computer system and subsequently takes a
3 corresponding remedial action, comprising:
4 a monitoring mechanism configured to monitor instrumentation signals
5 from the computer system while the computer system is operating;
6 a determination mechanism configured to determine from the
7 instrumentation signals if the computer system is in a failure sequence that is
8 likely to lead to undesirable system behavior, such as a system crash, wherein
9 determining if the computer system is in a failure sequence involves:
10 determining correlations between instrumentation signals in
11 the computer system, wherein determining the correlations
12 involves using a non-linear, non-parametric regression technique to
13 determine the correlations, whereby the correlations can
14 subsequently be used to generate estimated signals,
15 deriving estimated signals for a number of instrumentation
16 signals, wherein each estimated signal is derived from correlations
17 with other instrumentation signals, and
18 comparing an actual signal with an estimated signal for a
19 number of instrumentation signal to determine whether the
20 computer system is in a failure sequence;
21 wherein the determination mechanism is based on multivariate
22 correlations between multiple instrumentation signals and a failure sequence that
23 is likely to lead to undesirable system behavior; and
24 a remediation mechanism that is configured to take a remedial action if the
25 computer system is in a failure sequence that is likely to lead to undesirable
26 system behavior.